

Amendments to the claims

This listing of claims will replace all prior versions and listings of the claims.

Listing of Claims:

1- 29. (Canceled).

30. (Currently amended) A liquid stereolithography resin comprising a first urethane acrylate oligomer, a first acrylate monomer, a polymerization modifier, a second urethane acrylate oligomer different from the first urethane acrylate oligomer, and a stabilizer; wherein the first urethane acrylate oligomer is an aliphatic polyester urethane diacrylate oligomer, ~~an aliphatic urethane acrylate oligomer, an aliphatic urethane containing bound silicone, or an aromatic urethane acrylate oligomer~~, wherein the first acrylate monomer is ethoxylated (3) trimethylolpropane acrylate, and the polymerization modifier is selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof, wherein the resin includes 5-35 weight % an aliphatic polyester urethane diacrylate oligomer and 0.5-25 weight % ethoxylated (3) trimethylolpropane acrylate, wherein the resin includes 15-45 weight % ethoxylated (5) pentaerythritol tetraacrylate.

31. (Currently amended) A liquid stereolithography resin comprising a first urethane acrylate oligomer, a first acrylate monomer, a polymerization modifier, a second urethane acrylate oligomer different from the first urethane acrylate oligomer, and a stabilizer; wherein the first urethane acrylate oligomer is an aliphatic polyester urethane diacrylate oligomer, ~~an aliphatic urethane acrylate oligomer, an aliphatic urethane containing bound silicone, or an aromatic urethane acrylate oligomer~~, wherein the first acrylate monomer is ethoxylated (3) trimethylolpropane acrylate, and the polymerization modifier is selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof, wherein the resin includes 5-35 weight % an aliphatic polyester urethane diacrylate oligomer and 0.5-25

weight % ethoxylated (3) trimethylolpropane acrylate, wherein the resin includes 0.5-25 weight % an aliphatic urethane acrylate.

32. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 5-35 weight % tris-(2-hydroxyethyl)isocyanurate triacrylate.

33-36. (Canceled).

37. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 5-35 weight % isobornyl acrylate.

38. (Canceled).

39. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 10- 35 weight % an aliphatic polyester urethane diacrylate and 0.5-25 weight % isobornyl acrylate.

40. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 6-35 weight % isobornyl acrylate.

41-42. (Canceled).

43. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 50-80 weight % an aliphatic urethane containing bound silicone and 0.5-20 weight % isobornyl acrylate.

44-45. (Canceled).

46. (Previously presented) The liquid stereolithography resin of claim 30, wherein the first urethane acrylate oligomer is an aromatic urethane acrylate oligomer.

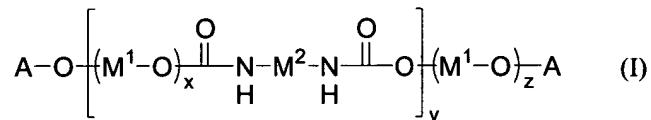
47. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 45-75 weight % an aromatic urethane acrylate oligomer and 10-70 weight % isobornyl acrylate.

48-50. (Canceled).

51. (Previously presented) The liquid stereolithography resin of claim 30, wherein the resin includes 10-40 weight % isobornyl acrylate.

52-55. (Canceled).

56. (Previously presented) The liquid stereolithography resin of claim 30 wherein the a first urethane acrylate oligomer has formula (I):

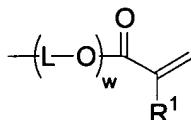


wherein

each M^1 is, independently, an alkylene, an acylalkylene, an oxyalkylene, an arylene, an acylarylene, or an oxyarylene, M^1 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, silicone, aryl, or aralkyl,

each M^2 is, independently, an alkylene or an arylene, M^2 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, silicone, aryl, or aralkyl,

each A , independently, has the a formula:

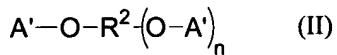


wherein R^1 is hydrogen or lower alkyl, each L is, independently, C_1-C_4 alkyl, and w is an integer ranging from 0 to 20, and

x is a positive integer less than 40, y is a positive integer less than 100, z is a positive

integer less than 40, and w, x, y, and z together are selected such that the molecular weight of the first urethane acrylate oligomer is less than 20,000;

a first acrylate monomer having formula (II):

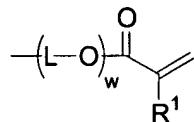


wherein

R^2 is a monovalent or polyvalent moiety selected from the group consisting of a C₁-C₁₂ aliphatic group, an aromatic group, and a poly(C₁-C₄ branched or unbranched alkyl ether), R^2 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, aryl, or aralkyl,

n is an integer ranging from 0 to 5, and

each A' has the formula:



wherein R^1 is hydrogen or lower alkyl, each L independently is C₁-C₄ alkyl, and w is an integer ranging from 0 to 20; and

a polymerization modifier selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof.

57. (Previously presented) The liquid stereolithography resin of claim 56, further comprising a photoinitiator.

58-68. (Cancelled)

69. (Previously presented) The liquid stereolithography resin of claim 30, further comprising a photoinitiator.

70. (Previously presented) The liquid stereolithography resin of claim 69, wherein the photoinitiator includes a phosphine oxide, an alpha-hydroxyketone, and a benzophenone derivative.

71. (Previously presented) The liquid stereolithography resin of claim 69, wherein the photoinitiator includes a component selected from the group consisting of a benzophenone, a benzil dimethyl ketal, a 1-hydroxy-cyclohexylphenylketone, an isopropyl thioxanthone, an ethyl 4-(dimethylamino)benzoate, a blend of 2,4,6-trimethylbenzoyldiphenyl phosphine oxide, 2,4,6-trimethylbenzophenone, 4-methylbenzophenone, and oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl)propanone, a benzoin normal butyl ether, a blend of oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl) propanone) and poly(2-hydroxy-2-methyl-1-phenyl-1-propanone), tripropylene glycol diacrylate, an oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl)propanone), a 2-hydroxy-2-methyl-1-phenyl-1-propanone, a poly(2-hydroxy-2-methyl-1-phenyl-1-propanone), a trimethylolpropane triacrylate, a mixture of 2,4,6-trimethylbenzophenone and 4-methylbenzophenone, a phosphine oxide, a 4-methylbenzophenone, a trimethylbenzophenone, a methylbenzophenone, and a blend of 2,4,6-trimethylbenzoyl-diphenyl-phosphineoxide and hydroxy-2-methyl-1-phenyl-propan-1-one.

72. (Currently amended) The liquid stereolithography resin of claim 69, wherein the photoinitiator includes a component selected from the group consisting of ~~a blend of~~ 2,4,6-trimethylbenzoyl-diphenyl-phosphineoxide and hydroxy-2-methyl-1-phenyl-propan-1-one, a phosphine oxide, and a 2-hydroxy-2-methyl-1-phenyl-1-propanone, and or mixtures thereof.

73. (Previously presented) The liquid stereolithography resin of claim 69, wherein the photoinitiator activates polymerization of an acrylate in a wavelength range of 240 nm to 250 nm, 360 nm to 380 nm, or 390 nm to 410 nm.

74-78. (Canceled).

79. (Previously presented) The liquid stereolithography resin of claim 30, wherein the stabilizer is selected from the group consisting of (bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate and 1-methyl-10-(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate), (bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate), MEQH (4-methoxyphenol), 2-(2'-hydroxy-5'-methylphenyl)benzotriazole, 1,2,2,6,6-pentamethyl-4-piperidyl methacrylate and (2-hydroxy-4-octyloxybenzophenone).

80. (Canceled).

81. (Previously presented) A liquid stereolithography resin comprising an aliphatic polyester urethane diacrylate oligomer, an ethoxylated (3) trimethylolpropane acrylate, and a polymerization modifier comprising a member selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof, wherein the resin includes 15-45 weight % ethoxylated (5) pentaerythritol tetraacrylate.

82. (Previously presented) A liquid stereolithography resin comprising an aliphatic polyester urethane diacrylate oligomer, an ethoxylated (3) trimethylolpropane acrylate, and a polymerization modifier comprising a member selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof, wherein the resin includes 0.5-25 weight % an aliphatic urethane acrylate.

83. (Canceled).

84. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 5-35 weight % tris-(2-hydroxyethyl)isocyanurate triacrylate.

85. (Canceled).

86. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 5-35 weight % isobornyl acrylate.

87. (Canceled).

88. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 10- 35 weight % an aliphatic polyester urethane diacrylate and 0.5-25 weight % isobornyl acrylate.

89. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 6-35 weight % isobornyl acrylate.

90. (Canceled).

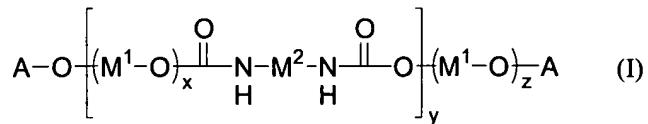
91. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 50-80 weight % an aliphatic urethane containing bound silicone and 0.5-20 weight % isobornyl acrylate.

92. (Canceled).

93. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 45-75 weight % an aromatic urethane acrylate oligomer and 10-70 weight % isobornyl acrylate.

94. (Previously presented) The liquid stereolithography resin of claim 31, wherein the resin includes 10-40 weight % isobornyl acrylate.

95. (Previously presented) The liquid stereolithography resin of claim 31, wherein the a first urethane acrylate oligomer has formula (I):

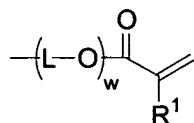


wherein

each M^1 is, independently, an alkylene, an acylalkylene, an oxyalkylene, an arylene, an acylarylene, or an oxyarylene, M^1 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, silicone, aryl, or aralkyl,

each M^2 is, independently, an alkylene or an arylene, M^2 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, silicone, aryl, or aralkyl,

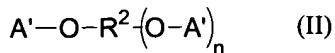
each A , independently, has a formula:



wherein R^1 is hydrogen or lower alkyl, each L is, independently, C_1-C_4 alkyl, and w is an integer ranging from 0 to 20, and

x is a positive integer less than 40, y is a positive integer less than 100, z is a positive integer less than 40, and w , x , y , and z together are selected such that the molecular weight of the first urethane acrylate oligomer is less than 20,000;

a first acrylate monomer having formula (II):

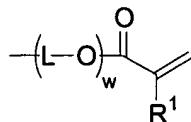


wherein

R^2 is a monovalent or polyvalent moiety selected from the group consisting of a C_1-C_{12} aliphatic group, an aromatic group, and a poly(C_1-C_4 branched or unbranched alkyl ether), R^2 being optionally substituted with alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, acyl, alkoxy, hydroxyl, hydroxylalkyl, halo, haloalkyl, amino, aryl, or aralkyl,

n is an integer ranging from 0 to 5, and

each A' has a formula:



wherein R¹ is hydrogen or lower alkyl, each L independently is C₁-C₄ alkyl, and w is an integer ranging from 0 to 20; and

a polymerization modifier selected from the group consisting of isobornyl acrylate, ethoxylated (5) pentaerythritol tetraacrylate, an aliphatic urethane acrylate, tris-(2-hydroxyethyl)isocyanurate triacrylate, and mixtures thereof.

96. (Previously presented) The liquid stereolithography resin of claim 95, further comprising a photoinitiator.

97. (Previously presented) The liquid stereolithography resin of claim 31, further comprising a photoinitiator.

98. (Previously presented) The liquid stereolithography resin of claim 97, wherein the photoinitiator includes a phosphine oxide, an alpha-hydroxyketone, and a benzophenone derivative.

99. (Previously presented) The liquid stereolithography resin of claim 97, wherein the photoinitiator includes a component selected from the group consisting of a benzophenone, a benzil dimethyl ketal, a 1-hydroxy-cyclohexylphenylketone, an isopropyl thioxanthone, an ethyl 4-(dimethylamino)benzoate, a blend of 2,4,6-trimethylbenzoyldiphenyl phosphine oxide, 2,4,6-trimethylbenzophenone, 4-methylbenzophenone, and oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl)propanone, a benzoin normal butyl ether, a blend of oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl)propanone) and poly(2-hydroxy-2-methyl-1-phenyl-1-propanone), tripropylene glycol diacrylate, an oligo(2-hydroxy-2-methyl-1-(4-(1-methylvinyl)phenyl)propanone), a 2-hydroxy-2-methyl-1-phenyl-1-propanone, a poly(2-hydroxy-2-methyl-1-phenyl-1-propanone), a trimethylolpropane triacrylate, a mixture of 2,4,6-trimethylbenzophenone and 4-methylbenzophenone, a phosphine oxide, a 4-

methylbenzophenone, a trimethylbenzophenone, a methylbenzophenone, and a blend of 2,4,6-trimethylbenzoyl-diphenyl-phosphineoxide and hydroxy-2-methyl-1-phenyl-propan-1-one.

100. (Currently amended) The liquid stereolithography resin of claim 97, wherein the photoinitiator includes a component selected from the group consisting of ~~a blend of~~ 2,4,6-trimethylbenzoyl-diphenyl-phosphineoxide and hydroxy-2-methyl-1-phenyl-propan-1-one, a phosphine oxide, and a 2-hydroxy-2-methyl-1-phenyl-1-propanone, and or mixtures thereof.

101. (Previously presented) The liquid stereolithography resin of claim 97, wherein the photoinitiator activates polymerization of an acrylate in a wavelength range of 240 nm to 250 nm, 360 nm to 380 nm, or 390 nm to 410 nm.

102. (Previously presented) The liquid stereolithography resin of claim 31, wherein the stabilizer is selected from the group consisting of (bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate and 1-methyl-10-(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate), (bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate), MEQH (4-methoxyphenol), 2-(2'-hydroxy-5'-methylphenyl)benzotriazole, 1,2,2,6,6-pentamethyl-4-piperidyl methacrylate and (2-hydroxy-4-octyloxybenzophenone).